GEOTECHNICAL ENGINEERING REPORT

Proposed HVAC Upgrade, Building 111
VA Medical Center
5000 W. National Avenue
Milwaukee, Wisconsin

GESTRA Project No.: 18096-10
April 20, 2018

Prepared For:
The Sigma Group
1300 W. Canal Street
Milwaukee, WI 53233

GESTRA

Geotechnical Engineering Report
HVAC Upgrade, Building 111 – VA Medical Center
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1300 W. Canal Street
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Report Prepared by:

GESTRA Engineering, Inc.
191 W. Edgerton Avenue
Milwaukee, WI 53207

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1.0 INTRODUCTION

GESTRA Engineering, Inc. (GESTRA) was authorized by The Sigma Group (Sigma) to complete a subsurface exploration and geotechnical engineering report for the foundation of the HVAC units planned to be installed and the renovation of Building 111 on the VA Medical Center campus located at 5000 W. National Avenue in Milwaukee, Wisconsin. This report presents the results from the subsurface soil exploration and describes the field exploration, laboratory test results, and provides geotechnical recommendations pertaining to the design and construction of the proposed project.

The engineering recommendations and analysis contained within this report are based on the following project information, which is a projection of GESTRA's understanding of the project. If for any reason the actual project information differs from what is reported below, GESTRA should be contacted so that we can review our recommendations in light of any new information.

1.1 Project Information

The project area is located within the southwest portion of Building 111 on the VA Medical Center campus. The project will include the demolition of the existing window wells on the south side of the building and construction of new wells. In addition, three, 5 inch thick concrete slab on grade pads will be constructed to support the installation of new HVAC units. The area of the pads are planned within the existing recessed unfinished crawl space below the first floor slab.

2.0 SCOPE OF WORK

GESTRA has performed the following services for the project.

- Contacted Diggers Hotline to identify public utility locations.
- Located the SPT soil borings and hand auger borings using tape and stake methods measured from existing site features. Ground surface elevations for the SPT soil borings were obtained using a survey level and rod and referenced to a site benchmark. Ground surface elevation of hand auger borings were measured from the underside of the existing first floor slab of Building 111.
- Performed two standard penetration test (SPT) soil borings to a depth of 36 feet each. At the completion of drilling, boreholes were abandoned per WDNR regulations.
- Performed three hand auger borings to a depth of 1 foot to 2 feet (refusal).
- Performed laboratory soil tests to assign classification and engineering properties to the soils encountered.

- Prepared this geotechnical engineering report presenting the field exploration, laboratory test results and provide recommendations related to estimated depth of fill, slab on grade for the HVAC pads and construction considerations.

3.0 EXPLORATION RESULTS

3.1 Historical and Existing Building Information

GESTRA reviewed the available historic aerial maps from the Milwaukee County LIO website. Prior to the construction of the existing Building 111, which occurred between 1963 and 1967, the project site was a vacant landscaped area. Based on the plan information provided, the existing structure is supported on driven pile, but the depth and capacity of the pile are not known. No information related to earthwork that may have been performed was available at the time of this report.

The ground elevations at the boring locations were measure by GESTRA at the time of the field work. The SPT borings were referenced to the first floor slab of Building 111 and the existing ground surface elevation at the soil boring locations was approximately 83.5 feet. The ground elevation at the hand auger borings was approximately 76.6 feet and was measured from bottom of the existing building first level slab assumed to be at an elevation of 82.7 feet, based on the plans provided.

3.2 Subsurface Soil Profile

GESTRA performed two SPT soil borings (B-1 and B-2) south of the existing building and three hand auger borings (HA-1 through HA-3) within the recessed crawl space.

SPT Soil Boring Locations

Fill was observed in both of the borings and varied in depth from 8.9 feet (B-1) and 11.5 feet (B-2). The fill material primarily consisted of lean clay. A granular (sand and gravel) layer was encountered in both of the borings between 2 and 4 feet. Moisture content tested on the cohesive fill material typically ranged between 16% and 20%. The native soils primarily consisted a layer of lean clay to a depth of 14 to 17.8 feet which then transitioned to medium dense sandy silt to silty sand. In boring B-2, lean clay was encountered at 31.8 feet to the termination depth of the boring. Moisture content tested on the native cohesive soil ranged between 12% and 27%.

Hand Auger Boring Locations

Hand auger borings were performed on the unfinished soil grade within the crawl space. Refusal was encountered in all of the hand auger borings between depths of 1 foot to 2 feet. The soil encountered was existing fill material and consisted of silty sand in boring HA-1 and lean clay in borings HA-2 and HA-3.

Results of the field and laboratory tests and observations are depicted on the individual test boring logs included in Appendix I. Soils were grouped together based on similar observed properties. The stratification lines were estimated by the reviewing engineer based on the available data and experience. The actual in-situ changes between layers may differ slightly and may be more gradual than depicted on the boring logs. Subsurface and groundwater conditions can vary between borehole locations and in areas not explored.

It is important to note that the soil observations and soil layer thickness estimates were made in small diameter boreholes. Therefore, it should be understood that thicker or thinner deposits of the individual strata are likely to be encountered within other portions of the project site. Furthermore, the estimation of strata thickness, such as topsoil or fill, at a particular location can differ from person to person due to a sometimes indistinct transition between the soils encountered. Additionally, it must be recognized that in the absence of foreign substances and/or debris within the soil samples obtained, it is sometimes difficult to distinguish between natural soils and clean soil fill.

3.3 Groundwater Observations

Groundwater observations were made during and at the completion of drilling operations for each SPT soil boring and hand auger boring. Groundwater was only encountered in boring B-1 at a depth of 29.5 feet during drilling operations. Typically, native fine grained soils of the type encountered in the borings are brown when they occur above, and gray when they occur below, the seasonal high groundwater table elevation. This change reflects oxidation of the soil above the groundwater table. Color changes were noted on the boring logs at a depth of between 17.8 feet.

Groundwater level fluctuations may occur with time and seasonal changes due to variations in precipitation, evaporation, surface water runoff and local dewatering. Perched water pockets and a higher water table may also be encountered during wet weather periods, particularly in more permeable silt and sand seams or granular fill material overlying less permeable clays. Installation and monitoring of an observation well would be required to assess a true groundwater elevation.

4.0 Analysis and Recommendations

4.1 HVAC Slab on Grade Pads

The extent and depth of fill material within the planned footprint of the HVAC slab on grade pads is unknown, since the hand auger borings encountered refusal within 2 feet of the existing ground surface. Based on the SPT soil borings performed south of Building 111, the fill material extended to elevations between 71.8 feet and 74.7 feet which would relate to a depth of 2.3 feet to 4.9 feet below the crawl space unfinished ground surface.

The slab load is estimated to not exceed 150 psf and the fill material in the samples collected from the borings was relatively consistent and did not contain any debris and/or organics. Therefore, the project may consider supporting the slab on grade pads on the existing inorganic site fill soils provided the owner understands and accepts the potential additional risks such as non-uniform subgrade conditions and consolidation of the underlying fill potentially resulting in detrimental total or differential settlement.

An estimated amount of settlement cannot be determined due to the fill material being undocumented and the unknown depth of the fill. Therefore, if unsuitable soil such as topsoil, vegetation, roots, debris, or deleterious material is encountered adjustments may need to be made during the excavation and construction for the slab on grade pads. Additional surface corrective measures beyond removing unsuitable soils, such as over-excavating the slab subgrade an additional 1 foot and placing additional base material may mitigate, but not entirely eliminate potential risks.

If the owner does not approve of the potential risk, substantial soil correction consisting of complete removal and replacement of the existing fill should be considered. Additional field testing, such as soil borings and hand auger borings, and dynamic compaction test (DCP), can be performed to better define the fill depths and to provide updated recommendations to the foundation design for the slab on grade pads, if the areas within the footprint of the pads become accessible during construction.

4.2 Below Grade Walls –Window Wells

Below grade window well walls will need to be designed to resist lateral earth pressures. The values presented in Table 4-1 were used in developing the equivalent fluid pressure parameters and assume that the walls are vertical; that a clean, free-draining granular fill is used as backfill within 2 feet behind the wall; the backfill condition at the ground surface is level; and that adequate drainage is provided to prevent the buildup of any hydrostatic pressure.

Table 4-1 – Below-Grade Wall Design Parameters

Below-Grade Wall Design Parameters	
Soil Type	Lean Clay
Total Unit Weight of Backfill (γ)	130 pcf
Angle of Internal Friction (Φ)	26º
At-Rest Earth Pressure Coefficient, (K_o)	0.561
Active Earth Pressure Coefficient, (K_a)	0.391
Passive Earth Pressure Coefficient, (K_p)	2.56

For walls that are free to rotate at least 0.001 times the height of the wall, such as a temporary earth retention system and retaining walls, then an active earth pressure condition will develop. For walls that will be restrained, such as permanent basement walls, then an at-rest condition will pertain. Equivalent fluid densities can be calculated by multiplying unit weight by the listed pressure coefficients at different conditions. For passive resistance, we recommend using a minimum factor of safety of 2.0 in passive earth pressure calculations because of the large strains required to mobilize the full passive resistance, ignoring the upper 2 feet of soil in frost protected areas, and ignoring the soil within the frost depth for other areas. Design of below grade walls should also consider loading from the adjacent buildings and any loading associated with parking lots or public utilities.

Drainage should be provided behind the below-grade walls to prevent the buildup of hydrostatic pressures. We recommend that free-draining granular drainage aggregate, such as ASTM Specification C33 Size No.67 washed concrete aggregate, be placed within 2 feet behind the back face of the below grade walls. Drainage pipes should also be installed along the perimeter of below-grade walls and should connect to the existing drainage system. The drainage pipes should be surrounded by a minimum of 6 inches of drainage aggregate. Due to the existing soils containing a high percentage of fine material, the drainage aggregate should be completely wrapped in a non-woven, high survivability, geotextile fabric with an apparent opening size (AOS) in the range of 70 to 100. The geotextile fabric should prevent migration of any adjacent soil into the drainage aggregate. The drain pipes should be supplied both inside and outside of the building footings, and be interconnected through the footing. We do not recommend using a drainage pipe that includes a geotextile sleeve in immediate contact with the pipe as an alternate to our recommendations. If drainage pipes cannot be connected to the existing drainage system or the walls are not designed with a drainage system, a watertight barrier should be placed below the slab and around the walls to prevent any water from accumulating in the window wells and the wall will need to be design to resist soil pressures and hydrostatic pressures.

We recommend a relatively impermeable barrier that may consist of a minimum 2 foot thick clay cap or Bituminous or Portland cement concrete (i.e. walkways and drives) be placed around each of the below-grade window wells to minimize surface water infiltration into the backfill against the walls. The clay material, if used, should be placed and compacted as recommended in this report and should extend from final grade to a depth of at least 2 feet. The clay cap or impermeable barrier should slope away from the structure at a minimum 2 percent grade. Surcharge loads, including those from adjacent (present and future) structures, as well as temporary construction equipment, within a zone defined by a plane extending at a 45 degree angle above the base of the wall should also be included in the design. The size of the compactor used behind the wall should be limited to less than 500 pounds to minimize stresses on the wall; however, maximum stresses allowed on the wall should be determined by the project structural engineer.

4.3 Construction Considerations

The detailed means and methods of excavation and construction should be decided by the contractor and approved by the project design team. Based on the geotechnical exploration results, the following issues should be taken in consideration during construction.

Dewatering

Based on the soil borings performed, substantial water is not anticipated to be encountered during excavation. If water is encountered during excavation, we anticipate the appropriate number of temporary sump pits and pumps should be sufficient to remove anticipated volume of water in the excavation. The contractor should be prepared to control the water and prevent it from accumulating in excavations or otherwise affecting construction.

Excavation Stability

Caving is a common issue for excavation side walls during construction, especially within existing fill and granular soils. An excavation plan should be developed and the length of excavation left open should be limited to prevent caving soil from covering the suitable bearing soils.

A temporary soil retention system may also be necessary in order to prevent caving or provide support of surrounding structures or utilities during construction. Providing recommendations or designing the retention system is out of scope for GESTRA. The contractor must comply with the federal, state, local and updated OSHA regulations during excavation and in retention system design to ensure excavation safety.

Occupational Safety and Health Act (OSHA) has instituted strict standards for temporary construction excavations. These standards are outlined in 29 CFR Part 1926 Subpart P. Excavations within unstable soil conditions or extending five feet or more in depth should be adequately sloped or braced according to these standards. Excavation safety is the responsibility of the contractor. Material stockpiles or heavy equipment should not be placed near the edge of the excavation slopes. The actual stable slope angle should be determined during construction and will depend upon the loading, soil, and groundwater conditions encountered.

Weather Implications

The subgrade soil might become unstable with exposure to adverse weather such as rain, snow and freezing temperatures. Unstable areas due to weather exposure may require an additional undercut or stabilization and the representative of the geotechnical engineer should assist with the determination of the depth of additional undercut or stabilization required based on observation of the field condition. During and post construction, the site should be graded in a manner to prevent ponding of water and should direct water away from excavations and planned structures.

Soil Sensitivity

Soil at the construction site will be exposed to moisture and disturbance from construction traffic, construction equipment and human factors. Since the near surface soils encountered are considered sensitive to moisture, every effort should be made to provide and maintain adequate drainage across the site during construction, and to minimize ponding on the subgrade. Slab on grade pads should be constructed immediately after the review of the representative geotechnical engineer.

Existing Adjacent Structures

New construction near or adjacent to existing foundations and structures requires special consideration. Because there may be some interaction between new and existing foundations and slab on grade pads, the existing building may experience some settlement. The effect of these settlements should be evaluated prior to finalizing the design.

Where new slab on grade pads or foundations are planned adjacent to existing spread foundations, the effects of overlapping soil stresses must be considered and the maximum net allowable soil bearing pressure must not be exceeded. The excavation and new construction should also consider the potential impact on the existing deep foundations. A temporary soil retention system may also be necessary to avoid undermining the existing building or other adjacent structures. The contractor and design team should consider the impact of the planned construction on any adjacent structures or utilities and should develop a plan of construction to mitigate impact. Evaluation of any adjacent structures or utilities or the effect of the construction on adjacent structures or utilities is outside the scope of GESTRA's services for this project. The project may also want to consider a pre and post condition survey to identify pre-existing distress of the structures adjacent to the planned construction and a monitoring plan during construction.

5.0 EXPLORATION AND TESTING PROCEDURES

5.1 Layout and Elevation Procedures

Two SPT soil borings were completed near the southwest building corner of Building 111 and three hand auger borings in the recessed area crawl space. Borehole locations were selected and located in the field by GESTRA using tape and stake methods. Ground surface elevations of the SPT soil borings were obtained by using a survey level and rod and referenced to a site benchmark (first floor slab of Building 111, elevation 83.7 feet). Elevation of hand auger borings were obtained by measuring from the bottom of the first floor slab (elevation 82.7 feet) to the existing unfinished ground. Elevation and thickness of slab was obtained from the Wall Section Drawing prepared by Bancroft Architects and Engineers.

5.2 Field Testing Procedures

SPT soil borings were drilled using a track mounted Diedrich D50 drill rig. The boreholes were initiated and advanced by using 3-1/4 inch hollow stem augers. A twenty-four inch split spoon sample was collected at the surface and eighteen inch split spoon samples at 2-1/2 foot intervals starting at a depth of 2 feet to 16 feet. At a depth of 16 feet samples were then collected at 5 foot intervals to 36 feet. All representative soil samples were taken in general accordance with the "Standard Method for Penetration Test and Split-Barrel Sampling of Soils" (ASTM D1586).

Hand auger borings were performed using a 1-1/4 inch diameter pig tail auger. A sample was retained at every 6 inches until refusal was encountered. Hand auger boring samples were taken in general accordance with the "Standard Practice for Soil Investigation and Sampling by Auger Borings" (ASTM D1452).

After each sampling, a soil sample was retained and placed in a jar and recorded for type, color, consistency, and moisture, sealed and then transported to the laboratory for further review and testing, if required. The specific drilling method used including the depths, rig type and crew chief are included on each of the individual boring logs as it may change for each hole.

5.3 Laboratory Testing Procedures

After completion of drilling operations, all of the retained soil samples were transported to GESTRA's laboratory and visually classified by a geotechnical engineer using the Unified Soil Classification System. A chart describing the classification system used is included in Appendix I. The engineer then assigned laboratory testing to aid in classification and extract index properties of the soil layers. These tests included hand penetrometer, moisture contents and Atterberg limits.

STANDARD OF CARE

Our exploration was limited to evaluating subsurface soil and groundwater conditions pertaining to the proposed project. GESTRA did not perform any environmental, chemical, or hydrogeologic testing as these were not part of our work scope.

This report should be made available in its entirety to bidding contractors for information purposes. The soil borings and site sketches should not be detached from this report. Our report is not valid if used for purposes other than what is described in the report.

All OSHA regulations such as those regarding proper sloping and temporary shoring of excavations should be followed during the entire construction process.

GESTRA has presented our professional opinions in this report in the form of recommendations. Our opinions are based on our understanding of current project information and related accepted engineering practices at the time of this report. Other than this, no warranty is implied or intended.

Sincerely,
GESTRA Engineering, Inc.

Report Prepared By:

Eric Jeske, P.E.
Staff Engineer

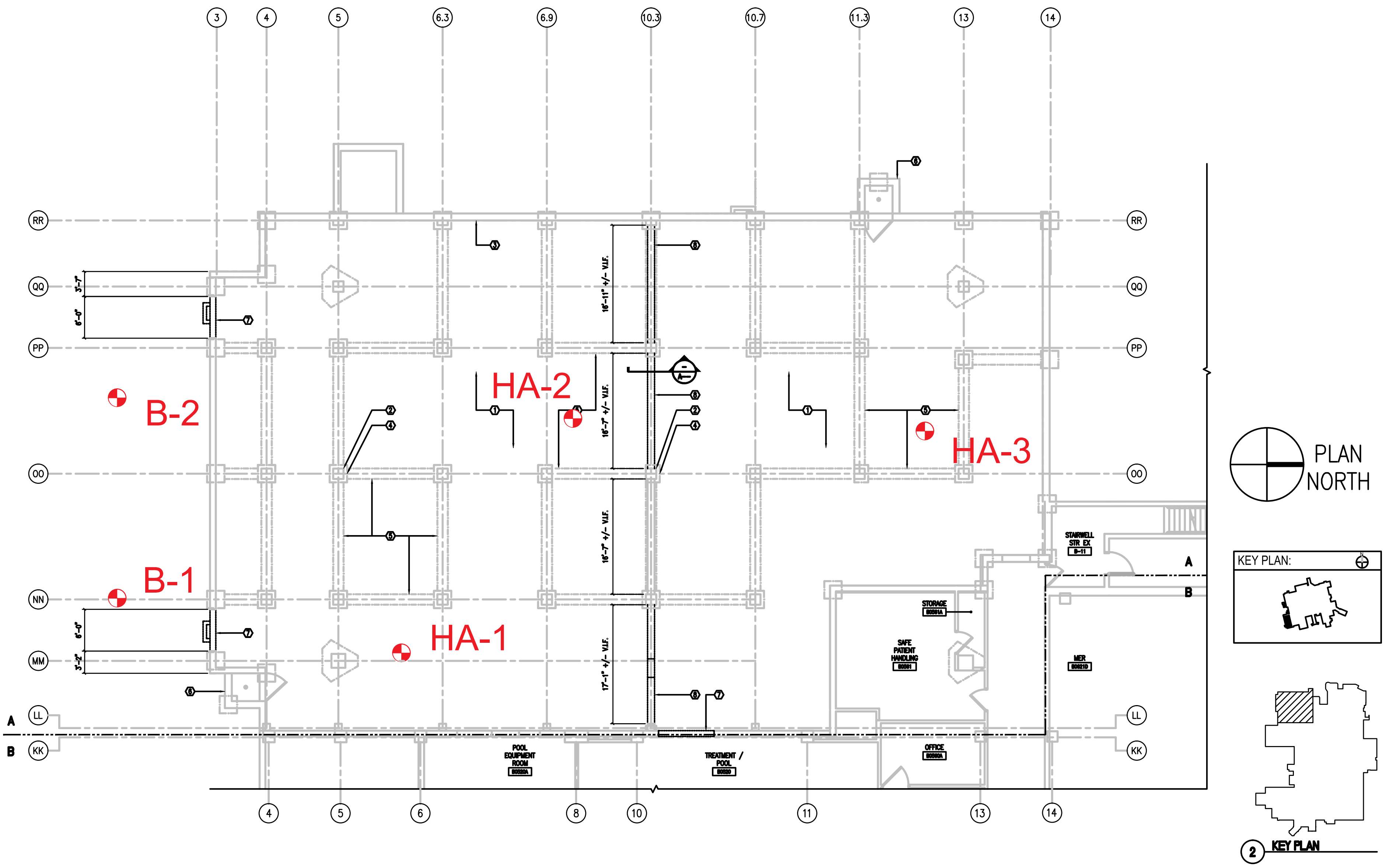
Report Reviewed By:

Douglas Dettmers, P.E.
Senior Engineer

APPENDIX I

SITE LOCATION MAP, BOREHOLE LOCATION MAP, TEST BORING LOGS, AND NOMENCLATURE

GESTRA Engineering, Inc. 191 W. Edgerton Avenue Milwaukee, WI 53207 Phone: (414) 933-7444 Fax: (414) 933-7844	Project Name & Location: HVAC Upgrade - VA Medical Hospital Milwaukee, WI	Scale: Not to Scale Drawing No.: 1 of 1 Prepared by: CA
	Drawing Title: Site Location Map	Checked by: EJ
	Project No.: 18096-10	Date: April 17th, 2018



= Approximate Boring Location

GESTRA Engineering, Inc.
191 W. Edgerton Avenue
Milwaukee, WI 53207
Phone: (414) 933-7444
Fax: (414) 933-7844

Project Name & Location:
HVAC Upgrade - VA Medical Hospital
Milwaukee, WI

Drawing Title:
Borehole Location Map

Project No.: 18096-10

Scale: 1" = 20'

Drawing No.: 1 of 1

Prepared by: CA

Checked by: EJ

Date: April 17th, 2018

GESTRA
Gestra Engineering Inc.
191 W. Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

SOIL BORING LOG

PROJECT NAME: HVAC Upgrade-VA Medical Center	DATE DRILLING STARTED: 4/12/2018	BORING NUMBER: B-1	
PROJECT LOCATION: Milwaukee, WI	DATE DRILLING ENDED: 4/12/2018	PROJECT NUMBER: 18096-10	DRILLING RIG: Diedrich D50 ATV
BORING DRILLED BY: FIRM: Gestra; CREW CHIEF: S. Gonyer	FIELD LOG: M. Rhodes	LATITUDE: ° ' "	DRILLING METHOD: 3¼" HSA
	LAB LOG / QC: C. Anderson	LONGITUDE: ° ' "	SURFACE ELEVATION: 83.6 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft)	Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
						TOPSOIL (7") 0.6 (83)								
SS - 1	24	1 4 6 7	10			LEAN CLAY WITH SAND, brown, moist, trace to with gravel, (FILL) 2 (81.6)							19.8	
SS - 2	15	6 14 15	29		80.0	SILTY GRAVEL WITH SAND, brown, moist, (FILL) 3.9 (79.7)								
SS - 3	10	2 3 4	7	5		LEAN CLAY, brown, moist, (FILL)							27.2	γ_d = 90.7 pcf, γ_T = 115.4 pcf
SS - 4	15	11 16 21	37		75.0	8.9 (74.7)							17.4	Sample SS-4 was disturbed; unable to obtain Qp
SS - 5	18	6 12 18	30	10		LEAN CLAY, brown, moist, hard	CL			4.50			16	
SS - 6	18	9 13 16	29		70.0	14 (69.6)				4.5+			17.8	
SS - 7	18	9 13 14	27	15		SILTY SAND, brown, moist, medium dense 17.8 (65.8)	SM							
					65.0	SILT, gray, moist, stiff								
SS - 8	18	5 5 8	13	20		22.8 (60.8)	ML			1.50			19.4	
					60.0	SANDY SILT, gray, very moist to wet, medium dense, with clay laminations	ML							
SS - 9	18	6 6 8	14	25									17.5	

WATER & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: 29.5 ft.	CAVE DEPTH AT COMPLETION: 28 ft. (WET ☐ DRY ☐)
WATER LEVEL AT COMPLETION: NE	CAVE DEPTH AFTER 0 HOURS: NMR (WET ☐ DRY ☐)
WATER LEVEL AFTER 0 HOURS: NMR	

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

GESTRA

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SOIL BORING LOG

PROJECT NAME: HVAC Upgrade-VA Medical Center	DATE DRILLING STARTED: 4/12/2018	BORING NUMBER: B-1	PROJECT NUMBER: 18096-10
PROJECT LOCATION: Milwaukee, WI	DATE DRILLING ENDED: 4/12/2018	DRILLING RIG: Diedrich D50 ATV	
BORING DRILLED BY: FIRM: Gestra; CREW CHIEF: S. Gonyer	FIELD LOG: M. Rhodes	LATITUDE: ° ' "	DRILLING METHOD: 3¼" HSA
	LAB LOG / QC: C. Anderson	LONGITUDE: ° ' "	SURFACE ELEVATION: 83.6 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft)	Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
					55.0	SANDY SILT, gray, very moist to wet, medium dense, with clay laminations	ML							
SS - 10	18	5 5 7	12	30									19.1	
					50.0									
SS - 11	18	5 6 5	11	35		36 (47.6)								
						End of Boring at 36.0 ft.								
				40	45.0									
				45	40.0									
				50	35.0									

WATER & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: 29.5 ft.	CAVE DEPTH AT COMPLETION: 28 ft. (WET ☐ DRY ☐)
WATER LEVEL AT COMPLETION: NE	CAVE DEPTH AFTER 0 HOURS: NMR (WET ☐ DRY ☐)
WATER LEVEL AFTER 0 HOURS: NMR	

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

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SOIL BORING LOG

PROJECT NAME: HVAC Upgrade-VA Medical Center	DATE DRILLING STARTED: 4/12/2018	BORING NUMBER: B-2	PROJECT NUMBER: 18096-10
PROJECT LOCATION: Milwaukee, WI	DATE DRILLING ENDED: 4/12/2018	DRILLING RIG: Diedrich D50 ATV	
BORING DRILLED BY: FIRM: Gestra, CREW CHIEF: S. Gonyer	FIELD LOG: M. Rhodes	LATITUDE: ° ' "	DRILLING METHOD: 3¼" HSA
	LAB LOG / QC: C. Anderson	LONGITUDE: ° ' "	SURFACE ELEVATION: 83.3 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft)	Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
SS - 1	15	1 2 3 4	5			LEAN CLAY, brown, moist, with sand and gravel, (FILL)							17.5	
						2 (81.3)								
SS - 2	16	3 3 4	7		80.0	CLAYEY SAND WITH GRAVEL, brown, moist, (FILL)								
						3.9 (79.4)								
						LEAN CLAY, brown, moist, (FILL)								
SS - 3	15	4 5 8	13	5							39	23	19.3	
SS - 4	18	3 5 7	12		75.0								17.8	
SS - 5	18	4 6 8	14	10		With dark brown at 9.5'							16.9	
						11.5 (71.8)								
						LEAN CLAY, brown, moist, very stiff to hard								
SS - 6	18	4 6 8	14		70.0					3.00			13.9	
							CL							
SS - 7	18	4 7 9	16	15						4.5+			12.6	
						17.8 (65.5)								
					65.0	SANDY SILT, gray, moist, medium dense								
SS - 8	18	6 9 12	21	20			ML							
						22.8 (60.5)								
					60.0	SILT, gray, moist, medium dense								
							ML							
SS - 9	18	5 5 7	12	25									13.8	

WATER & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: NE ft.	CAVE DEPTH AT COMPLETION: 24 ft. (WET / DRY)
WATER LEVEL AT COMPLETION: NE	CAVE DEPTH AFTER 0 HOURS: NMR (WET / DRY)
WATER LEVEL AFTER 0 HOURS: NMR	

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

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SOIL BORING LOG

PROJECT NAME: HVAC Upgrade-VA Medical Center	DATE DRILLING STARTED: 4/12/2018	BORING NUMBER: B-2	PROJECT NUMBER: 18096-10
PROJECT LOCATION: Milwaukee, WI	DATE DRILLING ENDED: 4/12/2018	DRILLING RIG: Diedrich D50 ATV	
BORING DRILLED BY: FIRM: Gestra, CREW CHIEF: S. Gonyer	FIELD LOG: M. Rhodes	LATITUDE: ° ' "	DRILLING METHOD: 3¼" HSA
	LAB LOG / QC: C. Anderson	LONGITUDE: ° ' "	SURFACE ELEVATION: 83.3 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft)	Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
					55.0	SILT, gray, moist, medium dense	ML							
SS - 10	18	6 4 7	11	30		With clay laminations in sample SS-10				2.50			20.2	
						31.8 (51.5)								
					50.0	LEAN CLAY, gray, very moist, very stiff	CL							
SS - 11	18	3 4 6	10	35						2.00	23	11	26.8	
						36 (47.3)								
						End of Boring at 36.0 ft.								
					45.0									
				40										
					40.0									
				45										
					35.0									
				50										

WATER & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: NE ft.	CAVE DEPTH AT COMPLETION: 24 ft. WET ☐ DRY ☐
WATER LEVEL AT COMPLETION: NE	CAVE DEPTH AFTER 0 HOURS: NMR WET ☐ DRY ☐
WATER LEVEL AFTER 0 HOURS: NMR	

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

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Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: HVAC Upgrade-VA Medical Center	DATE DRILLING STARTED: 4/12/2018	BORING NUMBER: **HA-1**	
PROJECT LOCATION: Milwaukee, WI	DATE DRILLING ENDED: 4/12/2018	PROJECT NUMBER: 18096-10	DRILLING RIG:
BORING DRILLED BY: FIRM: Gestra, CREW CHIEF: C. Anderson	FIELD LOG: M. Abdallah	LATITUDE: ° ' "	DRILLING METHOD: Hand Auger
	LAB LOG / QC: C. Anderson	LONGITUDE: ° ' "	SURFACE ELEVATION: 76.7 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft)	Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
					75.0	SILTY SAND WITH GRAVEL, brown, dry, (FILL) — 2 (74.7)								
						End of Boring at 2.0 ft.								
				5	70.0									
				10	65.0									
				15	60.0									
				20	55.0									
				25										

WATER & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: NE ft.	CAVE DEPTH AT COMPLETION: NMR (WET ☐ DRY ☐)
WATER LEVEL AT COMPLETION: NE	CAVE DEPTH AFTER 0 HOURS: NMR (WET ☐ DRY ☐)
WATER LEVEL AFTER 0 HOURS: NMR	

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

SOIL BORING LOG

Gestra Engineering Inc.
191 W. Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

PROJECT NAME: HVAC Upgrade-VA Medical Center	DATE DRILLING STARTED: 4/12/2018	BORING NUMBER: HA-2	PROJECT NUMBER: 18096-10
PROJECT LOCATION: Milwaukee, WI	DATE DRILLING ENDED: 4/12/2018	DRILLING RIG:	
BORING DRILLED BY: FIRM: Gestra; CREW CHIEF: C. Anderson	FIELD LOG: M. Abdallah	LATITUDE: ° ' "	DRILLING METHOD: Hand Auger
	LAB LOG / QC: C. Anderson	LONGITUDE: ° ' "	SURFACE ELEVATION: 76.6 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft)	Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
						LEAN CLAY, brown, dry, (FILL)								
					75.0	1.5 (75.1)								
						End of Boring at 1.5 ft.								
				5										
					70.0									
				10										
					65.0									
				15										
					60.0									
				20										
					55.0									
				25										

WATER & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: NE ft.	CAVE DEPTH AT COMPLETION: NMR (WET ☐ DRY ☐)
WATER LEVEL AT COMPLETION: NE	CAVE DEPTH AFTER 0 HOURS: NMR (WET ☐ DRY ☐)
WATER LEVEL AFTER 0 HOURS: NMR	

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

GESTRA
Gestra Engineering Inc.
191 W. Edgerton Avenue
Milwaukee, WI 53207
Phone: 414-933-7444, Fax: 414-933-7844

SOIL BORING LOG

PROJECT NAME: HVAC Upgrade-VA Medical Center	DATE DRILLING STARTED: 4/12/2018	BORING NUMBER: HA-3
PROJECT LOCATION: Milwaukee, WI	DATE DRILLING ENDED: 4/12/2018	PROJECT NUMBER: 18096-10
		DRILLING RIG:
BORING DRILLED BY: FIRM: Gestra; CREW CHIEF: C. Anderson	FIELD LOG: M. Abdallah / LAB LOG / QC: C. Anderson	LATITUDE: ° ' " / LONGITUDE: ° ' "
	DRILLING METHOD: Hand Auger	SURFACE ELEVATION: 76.6 ft

Number and Type	Recovery (in)	Blow Counts	N - Value	Depth (ft)	Elevation	Soil Description and Geological Origin for Each Major Unit	USCS Classification	Graphic	Well Diagram	Unconfined Comp. Strength (Q_u or Q_p) (tsf)	Liquid Limit	Plasticity Index	Moisture Content (%)	Comments
						LEAN CLAY, brown, dry, (FILL) 1 (75.6)								
					75.0	End of Boring at 1.0 ft.								
				5	70.0									
				10	65.0									
				15	60.0									
				20	55.0									
				25										

WATER & CAVE-IN OBSERVATION DATA

WATER ENCOUNTERED DURING DRILLING: NE ft.	CAVE DEPTH AT COMPLETION: NMR (WET ☐ DRY ☐)
WATER LEVEL AT COMPLETION: NE	CAVE DEPTH AFTER 0 HOURS: NMR (WET ☐ DRY ☐)
WATER LEVEL AFTER 0 HOURS: NMR	

NOTE: Stratification lines between soil types represent the approximate boundary; gradual transition between in-situ soil layers should be expected.

GENERAL NOTES

DRILLING AND SAMPLING SYMBOLS

SYMBOL	DEFINITION
HSA	Hollow Stem Auger
RWB	Rotary Wash Boring (Mud Drilling)
_FA	4”, 6” or 10” Diameter Flight Auger
_HA	2”, 4” or 6” Hand Auger
_DC	2 1/2” , 4” , 5” or 6” Steel Drive Casing
_RC	Size A, B, or N Rotary Casing
PD	Pipe Drill or Cleanout Tube
CS	Continuous Split Spoon Sampling
DM	Drill Mud
JW	Jetting Water
SS	2” O.D. Split Spoon Sample
_L	2 1/2” or 3 1/2” O.D. SB Liner Sample
ST	3” Thin Walled Tube Sample (Shelby Tube)
3TP	3” Thin Walled Tube (Pitcher Sampler)
_TO	2” or 3” Thin Walled Tube (Osterberg Sampler)
W	Wash Sample
B	Bag Sample
P	Test Pit Sample
_Q	BQ, NQ, or PQ Wireline System
_X	AX, BX, or NX Double Tube Barrel
CR	Core Recovery – Percent
NSR	No Sample Recovered, classification based on action of drilling, equipment and/or material noted in drilling fluid or on sampling bit.
NMR	No Measurement Recorded, primarily due to presence of drilling or coring fluid.
▽	Water Level Symbol

TEST SYMBOLS

SYMBOL	DEFINITION
MC	Moisture Content - % of Dry Wt. – ASTM D 2216
OC	Organic Content - % of Dry Wt. – ASTM D 2974
DD	Dry Density – Pounds Per Cubic Foot
LL, PL	Liquid and Plastic Limit – ASTM D 4318

Additional Insertions

SYMBOL	DEFINITION
Qu	Unconfined Comp. Strength-psf – ASTM D 2166
Qp	Penetrometer Reading – Tons/Square Foot
Ts	Torvane Reading – Tons/Square Foot
G	Specific Gravity – ASTM D 854
SL	Shrinkage Limits – ASTM D 427
OC	Organic Content – Combustion Method
SP	Swell Pressure - Tons/Square Foot
PS	Percent Swell
FS	Free Swell – Percent
pH	Hydrogen Ion Content. Meter Method
SC	Sulfate Content – Parts/ Million, same as mg/L
CC	Chloride Content - Parts/ Million, same as mg/L
C*	One Dimensional Consolidation – ASTM D 2453
Qc*	Triaxial Compression
D.S.*	Direct Shear – ASTM D 3080
K*	Coefficient of Permeability – cm/sec
D*	Dispersion test
DH*	Double Hydrometer – ASTM D 4221
MA*	Particle Size Analysis – ASTM D 422
R	Laboratory Receptivity, in ohm – cm – ASTM G 57
E*	Pressuremeter Deformation Modulus – TSF
PM*	Pressuremeter Test
VS*	Field Vane Shear – ASTM D 2573
IR*	Infiltrometer Test – ASTM D 3385
RQD	Rock Quality Designation – Percent

*See attached data sheet or graph

WATER LEVEL

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels may be considered reliable ground water levels. In clay soil, it may not be possible to determine the ground water level within the normal time required for test borings, except where lenses or layers of more pervious waterbearing soil are present. Even then, an extended period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the ground water table. Perched water refers to water above an impervious layer, thus impeded in reaching the water table. The available water level information is given at the bottom of the log sheet.

DESCRIPTIVE TERMINOLOGY

DENSITY TERM	“N” VALUE
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

CONSISTENCY TERM	Unconfined Compressive Strength, (tsf)	“N” VALUE
Very Soft	<0.25	0-2
Soft	0.25 - 0.49	2-4
Medium Stiff	0.5 - 0.99	4-8
Stiff	1.0 - 1.99	8-16
Very Stiff	2.0 - 3.99	16-30
Hard	4.0+	Over 30

Lamination	Up to 1/2” thick stratum
Layer	1/2” to 6” thick stratum
Lens	1/2” to 6” discontinuous stratum
Varved	Alternating laminations
Dry	Powdery, no noticeable water
Moist	Below saturation
Wet	Saturated, above liquid limit
Water bearing	Pervious soil below water

Standard “N” Penetration: Blows per Foot of a 140 Pound Hammer Falling 30 inches on a 2 inch OD Split Barrel Sampler

RELATIVE GRAVEL PROPORTIONS

CONDITION	TERM	RANGE
Coarse Grained Soils	trace of gravel	2-14%
	with gravel	15-49%
Fine Grained Soils		
15-29% + No. 200	trace of gravel	2-14%
15-29% + No. 200	with gravel	15-29%
30% + No. 200	trace of gravel	2-14%
30% + No. 200	with gravel	15-24%
30% + No. 200	gravelly	25-49%

RELATIVE SIZES

Boulder	Over 12”
Cobble	3” - 12”
Gravel	
Coarse	3/4” - 3”
Fine	#4 – 3/4”
Sand	
Coarse	#4 - #10
Medium	#10 - #40
Fine	#40- #200
Silt & Clay	- # 200, Based on Plasticity

SOILS CLASSIFICATION FOR ENGINEERING PURPOSES **ASTM Designation: D 2487 - 83** **(Based on Unified Soil Classification System)**	SOIL ENGINEERING

Criteria for Assigning GroupSymbols and Group Names Using Laboratory Tests [A]				Soil Classification[B]: Group Symble	Soil Classification[B]: Group Name
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less Less than 5% fines [C]	Cu≥ 4 and 1≤ Cc ≤3[E]	GW	Well graded gravel [F]
			Cu< 4 and/or 1> Cc >3[E]	GP	Poorly graded gravel [F]
		Gravels with Fines more than 12% fines [C]	Fines Classify as ML or MH	GM	Silty gravel [F.G.H.]
			Fines classify as CL or CH	GC	Clayey gravel [F.G.H.]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean sandss Less than 5% fines [D]	Cu≥ 6 and 1≤ Cc ≤3[E]	SW	Well graded sand [I]
			Cu< 6 and/or 1> Cc >3[E]	SP	Poorly graded sand [I]
		Sands with Fines more than 12% fines [D]	Fines Classify as ML or MH	SM	Silty sand [G.H.I]
			Fines classify as CL or CH	SC	Clayey sand [G.H.I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid Limit less than 50	inorganic	PI >7 and plots on or above " A" line	CL	Lean clay [K.L.M]
			PI<4 or plots below " A " line	ML	Silt [K.L.M]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [K.L.M.N] Organic Silt [K.L.M.O]
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above " A " line	CH	Fat clay [K.L.M]
			PI plots below " A " line	MH	Elastic silt [K.L.M]
		Organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay [K.L.M.P] Organic Silt [K.L.M.Q]
Highly organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat
Fibric Peat > 67% Fibers		Hemic Peat 33 % - 67 % Fibers		sapric	Peat < 33% Fibers

[A] Based on the material passing the 3-in (75- mm)sieve

[B] If field sample contained cobbles or boulders, or both. add with cobbles or boulders, or both to group name

[C] Gravels with 5 to 12 % fines require dual symbols:
GW - GM well-graded gravel with silt
GW - GC well-graded gravel with clay
GP - GM poorly-graded gravel with Silt
GP - GC poorly-graded gravel with clay

[D] Sands with 5 to 12 % fines require dual symbols:
SW -SM well-graded sand with silt
SW - SC well-graded sand with clay
SP - SM poorly-graded sand with Silt
SP - SC poorly-graded sand with clay

[E] $Cu = \frac{D_{60}}{D_{10}}$ $\qquad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name

[G] If fines classify as CL-ML, use dual symbol GC-GM. or SC-SM

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL_ML silty clay

If soil contains 15 to 29% plus No. 200, add, "with sand" or " with gravel", whichever is predominent

[L] If soil contains ≥ 30% plus No.200, predominantly sand, add "sandy" to the group name

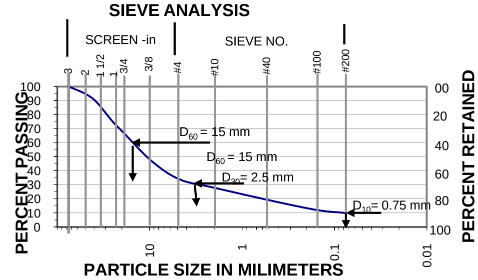
[M] If soil contains ≥ 30% plus No.200, predominantly gravel add "gravelly" to the group name

[N] PI ≥4 and plots on or above "A" Line

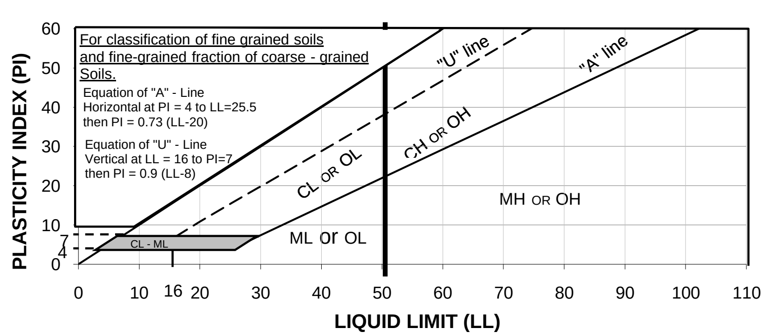
[O] PI < 4 or plots below "A" Line

[P] PI plots on or above "A" Line

[Q] PI plots below "A" Line



$Cu = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200 \qquad C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}} = \frac{(2.5)^2}{15 \times 0.075} = 5.6$



APPENDIX II

LABORATORY TEST RESULTS

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of
Moisture Content, Organic Content, and Density of Soil

Project Name:	VA HVAC Upgrade		Date:	April 13, 2018
Project Number:	18096-10		Report To:	The Sigma Group
Project Location:	Milwaukee, WI			
ASTM Designation:	**D2216, D 2974**			

Boring Number	B-1	B-1	B-1	B-1	B-1	B-1	B-1	B-1
Sample Number	1	3	4	5	6	8	9	10
Cup Number	Q-9	T-100	P-3	Y-6	A-10	T-3	P-21	B-1
Weight of Cup (g)	25.17	25.31	23.43	26.54	25.21	24.68	26.35	26.65
Weight of Wet Soil and Cup (g)	54.50	48.54	51.05	53.31	46.89	50.27	56.68	56.89
Weight of Dry Soil and Cup (g)	49.65	43.57	46.95	49.61	43.62	46.11	52.16	52.03
Weight of Soil and Cup After Burn (g)								
Weight of Sample for Density (lbs)		0.088						
Diameter (in)		1.386						
Length(in)		0.871						
Moisture Content (%)	19.8	27.2	17.4	16.0	17.8	19.4	17.5	19.1
Organic Content (%)								
Wet Density (pcf)		115.7						
Dry Density (pcf)		91.0						

Boring Number								
Sample Number								
Cup Number								
Weight of Cup (g)								
Weight of Wet Soil and Cup (g)								
Weight of Dry Soil and Cup (g)								
Weight of Soil and Cup After Burn (g)								
Weight of Sample for Density (lbs)								
Diameter (in)								
Length(in)								
Moisture Content (%)								
Organic Content (%)								
Wet Density (pcf)								
Dry Density (pcf)								

Performed by C. Anderson

Reviewed by E. Jeske, PE

GESTRA

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of
Moisture Content, Organic Content, and Density of Soil

Project Name:	VA HVAC Upgrade	Date:	April 13, 2018
Project Number:	18096-10	Report To:	The Sigma Group
Project Location:	Milwaukee, WI		
ASTM Designation:	**D2216, D 2974**		

Boring Number	B-2	B-2	B-2	B-2	B-2	B-2	B-2	B-2
Sample Number	1	3	4	5	6	7	9	10
Cup Number	T-6	A-31	P-8	B-8	V-1	T-10	P-4	T-9
Weight of Cup (g)	23.51	22.37	26.52	26.71	24.30	26.60	25.63	23.38
Weight of Wet Soil and Cup (g)	51.99	51.58	48.86	52.42	47.55	56.25	50.20	45.28
Weight of Dry Soil and Cup (g)	47.75	46.85	45.49	48.70	44.72	52.94	47.23	41.60
Weight of Soil and Cup After Burn (g)								
Weight of Sample for Density (lbs)								
Diameter (in)								
Length(in)								
Moisture Content (%)	17.5	19.3	17.8	16.9	13.9	12.6	13.8	20.2
Organic Content (%)								
Wet Density (pcf)								
Dry Density (pcf)								

Boring Number	B-2							
Sample Number	11							
Cup Number	V2B							
Weight of Cup (g)	24.84							
Weight of Wet Soil and Cup (g)	49.18							
Weight of Dry Soil and Cup (g)	44.03							
Weight of Soil and Cup After Burn (g)								
Weight of Sample for Density (lbs)								
Diameter (in)								
Length(in)								
Moisture Content (%)	26.8							
Organic Content (%)								
Wet Density (pcf)								
Dry Density (pcf)								

Performed by C. Anderson

Reviewed by E. Jeske, PE

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of
Atterberg Limits of Soil

Project Name:	VA HVAC Upgrade	Date:	April 18, 2018
Project Number:	18096-10	Client:	The Sigma Group
Project Location:	Milwaukee, WI		
ASTM Designation:	**D4318**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-2
Sample Number	3
Depth of Sample	4.5'-6'

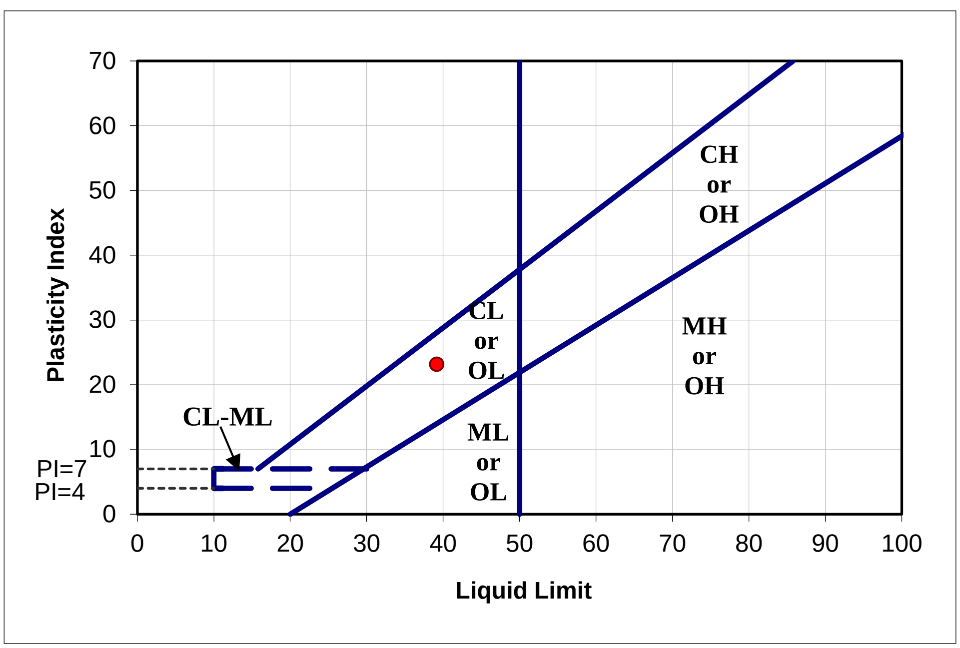
Determination of Liquid Limit

Cup Number	D23	B9	B34
Weight of Cup (g)	14.50	14.30	14.33
Weight of Wet Soil and Cup (g)	37.23	36.82	37.51
Weight of Dry Soil and Cup (g)	30.97	30.45	30.80
Moisture Content (%)	38.0	39.4	40.7
Blow Counts	32	23	16

Determination of Plastic Limit

Cup Number	B8	L7
Weight of Cup (g)	7.23	7.36
Weight of Wet Soil and Cup (g)	14.25	13.81
Weight of Dry Soil and Cup (g)	13.25	12.91
Moisture Content (%)	16.6	16.2

Compilation of Test Results



Liquid Limit	39
Plastic Limit	16
Plasticity Index	23
USCS Symbol	**CL**

Performed by: B. Bills

Reviewed By: C. Anderson
GESTRA Engineering, Inc.

Geotechnical-Structural-Pavement-Construction Material

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of
Atterberg Limits of Soil

Project Name:	VA HVAC Upgrade	Date:	April 18, 2018
Project Number:	18096-10	Client:	The Sigma Group
Project Location:	Milwaukee, WI		
ASTM Designation:	**D4318**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-2
Sample Number	11
Depth of Sample	34.5'-36'

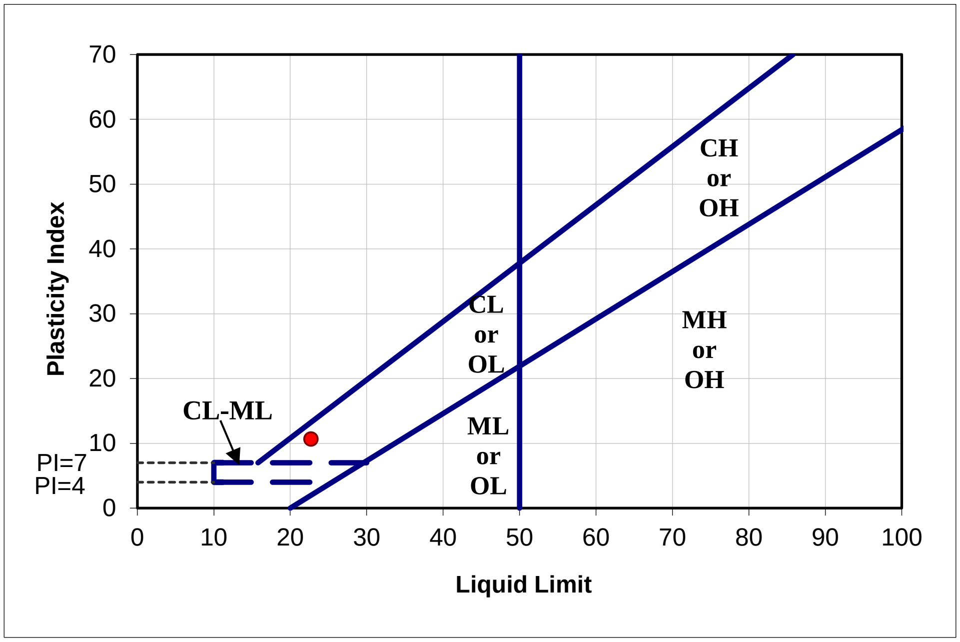
Determination of Liquid Limit

Cup Number	D13	D3	L13
Weight of Cup (g)	14.34	14.40	13.95
Weight of Wet Soil and Cup (g)	37.25	37.29	29.53
Weight of Dry Soil and Cup (g)	33.18	33.08	26.51
Moisture Content (%)	21.6	22.5	24.0
Blow Counts	35	24	15

Determination of Plastic Limit

Cup Number	D8	D7
Weight of Cup (g)	7.22	7.23
Weight of Wet Soil and Cup (g)	13.90	13.72
Weight of Dry Soil and Cup (g)	13.20	13.02
Moisture Content (%)	11.7	12.1

Compilation of Test Results



Liquid Limit	23
Plastic Limit	12
Plasticity Index	11
USCS Symbol	**CL**

Performed by: B. Bills

Reviewed By: C. Anderson
GESTRA Engineering, Inc.